ANATOMY OF CGN

APNIC37 PLENARY PRESENTATION

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IT'S HOW
WE CONNECT

AGENDA

1. CGN solution for Telstra mobiles
2. Fabricated reality
3. Do you want the Blue Pill? Or the Red Pill?
4. Truth of reality

# CGN SOLUTION FOR TELSTRA MOBILES

CGN SOLUTION FOR TELSTRA MOBILES

Telstra introduced a CGN early in the development of its mobile network to maximize its address utilisation efficiency. Users are allocated a private IPv4 address and then translated to a public IPv4 address.

CGN has been deployed for Telstra's Mobile network performing NAT44 before the APNIC exhaustion of IPv4 addresses.

PAT has been deployed recently to further improve public IPv4 address efficiency by the Mobile Network, allowing for address reuse elsewhere in Telstra.

Traffic to the internet originating from our users is allowed to pass without interruption.

Internet originating traffic is dropped.
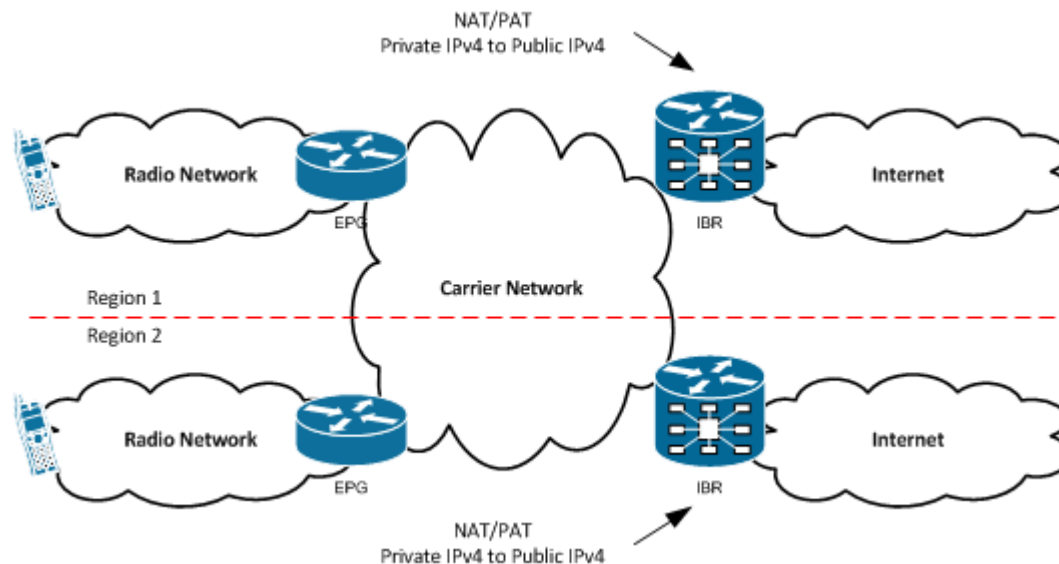
FABRICATED REALITY

FABRICATED REALITY

Lets assume:

1. You need to allocate to your users a Private Address at the User Gateway

2. You have a finite Public IPv4 range and cannot obtain more

3. You have a finite Private IPv4 range shared internally and cannot obtain more. Modular architectures reusing RFC1918 address spaces are possible but may not always be an option.

What are your options?

You can centralise or regionalise your network design

- Centralisation will increase latency and resource utilisation on the Gateway
- Regionalisation will mean you need smaller public IPv4 pool sizes at each Gateway and deploy PAT

You can place the CGN closer to the user

- Would this increase the number of public IPv4 utilised? If the user only requires internal content services for a session, the public IPv4 allocation would be wasted

You can do NAT444

- If you have major issues with Private Address depletion on-top of Public Address depletion, this is possible.
- Investigations and Troubleshooting becomes extremely difficult
- Compliance with regulatory obligations will require the development of complex solutions

Before you consider CGN, do you have an IPv6 strategy?

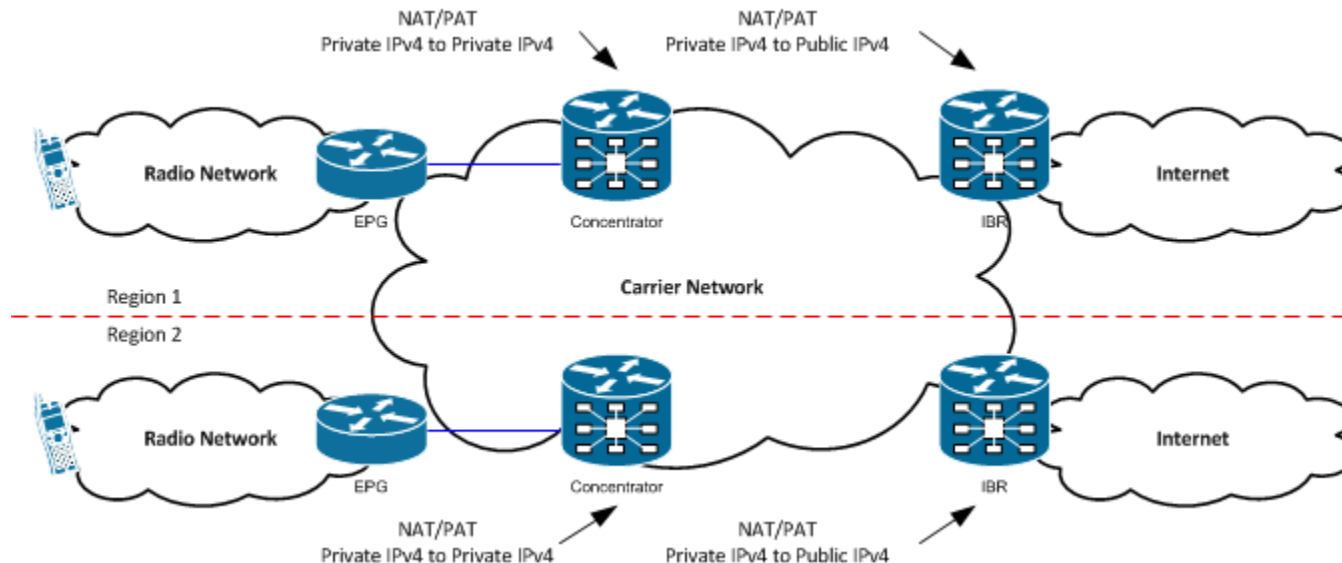# THE BLUE PILL?
OR
THE RED PILL?

THE BLUE PILL
THE BLISSFUL IGNORANCE OF ILLUSION

Many believe CGN will resolve the IPv4 depletion problem or extend it and IPv4 depletion issue will disappear and be manageable using CGN

IPv4 Public Address depletion has already occurred in Asia Pacific.

Some operators will begin looking at Private Address utilisation probably for the first time and deploying a CGN

Be very careful in differentiating between tunnels and translators!

THE BLUE PILL
THE BLISSFUL IGNORANCE OF ILLUSION

A single CGN in the traffic flow may be capable of helping you manage IPv4 depletion. But doing NAT444…

- Investigations and Troubleshooting becomes extremely difficult
- Compliance with regulatory obligations will require the development of complex solutions
- Scalability and Reliability becomes major issues
- Lots of applications will break!

Note: in a way, for some mobile networks, NAT444 is already deployed whenever a user enables WiFi Tethering on their UE. In Fixed networks, NAT44 is already deployed at the User Gateway or CPE.

What about Dual-Stack and IPv6? How does this relate?

Dual-Stack does nothing to alleviate the IPv4 depletion situation.

THE RED PILL
THE PAINFUL TRUTH OF REALITY

CGN will extend the use of your public IPv4 allocation, but the IPv4 depletion issue will NOT disappear by deploying CGN!

IPv4 Public Address depletion has already occurred in Asia Pacific

Will it cost more in the future to obtain more IPv4 addresses, and to fund development on ways to overcome the issues caused by NAT444 compared to funding IPv6 directly?

CGN should be used to give yourself time to deploy IPv6 Single Stack only. The only real solution to resolve IPv4 depletion is to deploy IPv6!

Deploy PAT if you have a CGN already. You will need more logging but it will give you more time to get your network ready for IPv6

Recover as many IPv4 addresses as possible

Do I use a tunnel/encapsulator or a translator for IPv6 traffic going to IPv4?
(MAPT/E vs 464XLAT)

So how does IPv6 relate to CGN deployment?

What??? Even IPv6 needs a NAT?

Yes it does. This is because not everything on the internet is IPv6 enabled. You will need a translator for traffic to IPv4 destinations. This is called NAT64 (RFC 6052/6146)

I'll just Dual-Stack

Absolutely. But you need to allocate an IPv4 address to your UE/CPE. Didn't you have a depletion issue?
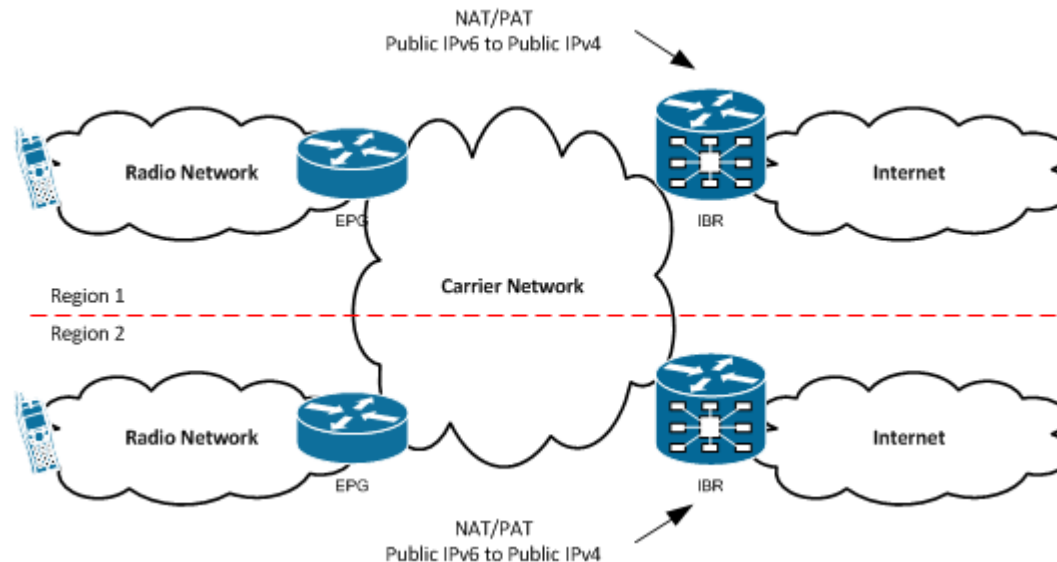
THE RED PILL
THE PAINFUL TRUTH OF REALITY

DNS64 – is it needed?

464XLAT does not solve some cases and it is called only if the application does not understand IPv6. What if the application you are running does understand IPv6 but is attempting to reach an IPv4 destination? 464XLAT will not be used.

464XLAT isn't that complicating things more?

The reality is, not all applications understand IPv6. They need something to translate to IPv6. There are other options, but in mobile networks at this current point, 464XLAT makes the most sense.

464XLAT will not be required in the future if content and applications are fully protocol agnostic and do not have IPv4 literals. The reality is, there are so many applications, we will never be certain this will be the case.

Don't forget about Application Layer Gateways

NAT/PAT will break connections and you need ALGs. NAT444 will just make things break even more. NAT64 – you need to ensure the existing ALGs for NAT44 also work for NAT64.

TRUTH OF REALITY

TRUTH OF REALITY
HOW DEEP DOES THE RABBIT HOLE GO?

Telstra is committed to introducing IPv6 into its Mobile Network, with testing happening for the past 3 years while the technology is maturing from our providers. CGN is part of this strategy during the transition.

These are the steps to introduce IPv6 and CGN:

Deploy IPv6 in the infrastructure

Deploy CGN at the Internet Border Router with NAT64

Introduce a DNS64 function into DNS resolvers/forwarders

Connect user devices using Single Stack IPv6

Implement 464XLAT on the user devices

There will eventually be a time where the only function the CGN will perform is NAT64, and later, eventually completely removed. Aim for this end-goal when going down the rabbit hole.

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